national accelerator laboratory

ACCELERATOR EXPERIMENT--Determine and Correct, if necessary,
the Main Ring/Booster Radius Ratio

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Measurement and Analysis:

1. At the start of the experiment, the booster rf extraction
    frequency and "best" main ring rf capture frequency were

    $$f_B = 52.7494 \text{ MHz}$$
    $$f_M = 52.7526 \text{ MHz}.$$

    Hence, the relative radii were

    $$RM/R_B = \left(\frac{1113}{52.7526}\right)\left(\frac{52.7494}{84}\right) = 13.2492.$$

2. In order to correct the ratio to 13.25 without affecting the
    booster extraction momentum, the booster field was changed by

    $$\Delta B/_B = (5.446)^2 \frac{0.0032}{52.7494} = 1.84 \times 10^{-3}.$$

    The frequency was then adjusted by moving the extraction radius
    by means of the programmed radial position.

3. The final frequencies were

    $$f_B = 52.7522 \text{ MHz}$$
    $$f_M = 52.7526 \text{ MHz}.$$

The final relative radii were

$$RM/R_B = 13.2499.$$

An extracted 100-GeV beam was reestablished within 10 minutes of the booster field and frequency changes. The <u>only</u> retuning required consisted of a slight change in the 5° bending magnet current and a minor readjustment of the horizontal steering magnets.

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